

# **VOICE RECOGNITION**

***Can We Talk?***

***Submitted by:***

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**March 27, 2006**

## **Introduction**

I had the pleasure of sitting with a Computer Aided Dispatch / Records Management System (CAD/RMS) vendor the other day who was pontificating on the attributes of the mobile data application of his product. He was selling me hard, and I don't quite know why...he already knows he's getting my business. So I shifted the conversation and asked how his product might work with voice recognition software to operate all components in the vehicle, including the mobile data computers (MDC's). There was a moment of silence...imagine that, a quiet salesman! When he finally spoke, it was clear he was not up on the progress voice recognition technology (VRT) has made in recent years, and further, he was not much interested. As a result, he made his best attempt to discourage me...they don't work, they add cost, they are nothing more than technology for technology's sake. Some of his concerns are valid and should be considered, but in this day and age, none of the concerns he raised override the potential benefit this cutting edge technology has to offer.

### ***Technology in Modern Policing***

The modernization of policing has brought about incredible opportunities to better serve our communities. Technology has revolutionized police service delivery during the last century by utilizing many modern devices we sometimes take for granted, such as the automobile, radio technology, computer systems, E911 answering, cellular telephones, etc. These advances have allowed officers to get to problems more quickly, with greatly enhanced communication and crime fighting tools at their disposal. The mission of the

police officer to protect life and property has remained, but technology has significantly changed and improved our methods for deploying resources. By examining the innovations of our history, as well as the explosion of technological improvement and discovery we are currently experiencing, it is natural to assume service delivery methods in policing will also continue to make incredible progress.

Voice recognition is touted by industry experts as a means for increasing speed and efficiency in operating computer programs, providing cost and time savings and protection against repetitive stress injuries. When used in a patrol unit environment, there is also the potential for increasing safety by substituting multiple manual operations with voice commands. These all sound good to a manager of people who regularly utilize PC based applications, while also trying to effectively and safely operate a motor vehicle.

The way in which technology is chosen and implemented is extremely important, as is the foundation for success or failure of any particular tool that is put into service. The challenge for law enforcement managers will be to make appropriate choices regarding the various technologies available. Factors that drive our pursuit of specific high-tech products usually revolve around the potential for improved service, safety or efficiency. Voice recognition technology presents itself as a logical next step in high-tech solutions for policing because it has potential to provide improved performance in all three of these categories. The prudent manager must explore to what degree this technology will solve or improve existing circumstances, how far reaching VRT can be applied and

implemented with success, what potential new challenges are associated with voice recognition software and whether the benefits outweigh the cost.

### *The Evolution of Voice Recognition*

If you are like most, you probably believe voice recognition technology is a new thing. You won't want to be a beta test site for some new-fangled, fly-by-night fad, and you'll be tempted to wait for the industry to "work out the bugs" before you buy. What you don't know is... the future is now. Voice recognition technology is not merely in its infancy, struggling to find direction, consistency and a market for its use. It has many applications being used in a variety of fields, and policing is no exception.

Voice Recognition Technology (VRT) has been around for about 70 years; however, it has taken considerable time for the technology to become viable.<sup>1</sup> In the last few years, voice recognition has become efficient, affordable and practical for everyday use in business. The challenge at this point is for VRT to overcome the bad rap it acquired in the early days of its evolution. What started as simple text recognition in short commands now allows for full dictation and navigation of numerous major computer software programs as well as the worldwide web.<sup>2</sup>

The future of VRT will allow us vocal command of virtually everything in our businesses and homes. Moreover, if companies like Microsoft, Intel and Cisco have their way, future cellular phones, Personal Digital Assistants (PDAs) and television sets won't come

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<sup>1</sup> Author Unknown. (2005) *A Timeline & History of Voice Recognition Software*, Internet Article, [http://www.dragon-medical-transcription.com/history\\_speech\\_recognition\\_timeline.html](http://www.dragon-medical-transcription.com/history_speech_recognition_timeline.html)

<sup>2</sup> Dragon Naturally Speaking software instruction manual

with any buttons. In fact, speech will become the primary interface, especially in mobile computing.<sup>3</sup> Various disciplines are beginning to integrate this mindset and the associated technologies into their own industry specific software applications. As the world becomes more and more technology oriented, with all forms of work being computerized to some degree, the need to integrate voice commands for multitasking efficiency is increasingly apparent. This has become painfully true in policing, as more technology is pushed into our patrol vehicles. By offering operational options to an officer, multiple commands may be executed at once while eyes are on the roadway. This maximizes the benefit of other on-board technology, while increasing safety and efficiency for the officer.

### ***Voice Recognition in Policing***

Policing is a good example of how technology has been both a blessing and a burden to the officers who must work with it. Patrol units are a crowded, high tech cockpit of sorts; with standard lights, siren and radio functions, audio-video recorders, mobile data computers, electronic citation and field reporting tools. Trying to utilize all of these electronic tools solely by touch is challenging and may hinder officer efficiency and safety. The integration of voice recognition technology into the patrol environment has been offered as a potential solution for maximizing officer efficiency and improving safety while driving and multi-tasking the bevy of equipment in the police unit.

There are currently two leading expert organizations in the field of voice recognition application in patrol services; the University of New Hampshire (UNH) and Visteon

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<sup>3</sup> Batista, E. (2001) *Speaking of Voice Recognition*, Wired News

Corporation in Dearborn, Michigan. UNH was the first to venture into this cutting edge implementation. They have equipped over 400 police cars nationwide with their VRT system called "Project 54." Named after the 1960's television show, "Car 54, Where are you?" Project 54 was conceptualized by UNH engineers after witnessing the number of tasks officers must perform behind the wheel. Brett Vinciguerra, one of the UNH staff on the project noted, "To pull you over for doing one thing, they have to do 12 different things," meaning that a simple traffic stop is actually a complicated series of events for an officer to perform just to give a traffic warning or citation.<sup>4</sup> Work began in earnest on Project 54 in 1999, utilizing 6 UNH faculty members and 14 graduate students to research and develop a voice recognition solution applicable in the patrol unit environment. The Project, funded by the US Department of Justice, seeks to "revolutionize the way information technology is acquired and used to meet the needs of police officers in the field. It is a standards-based system with off-the-shelf components."<sup>5</sup>

UNH utilized their own University police vehicles to receive and test the initial installations, which began in January 2002. The project quickly expanded into the police cruisers of many small municipalities throughout New Hampshire, with a large installation into their State Police vehicles by 2003. The success of these departments led to industry recognition and considerable interest by law enforcement agencies

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<sup>4</sup> Author Unknown, (2003) *New Police Cars Have Voice Recognition*, Associated Press, <http://www.project54.unh.edu/Reference/Download.pm/1951/Document.HTML>

<sup>5</sup> Lenharth, W. H., Kun, A. & Miller, W. T. (2004), *Human Factors Engineering and Project 54*

nationwide. Subsequent installations include the City of Carlsbad as the first California police agency to give Project 54 a go.

Visteon Corporation's TacNet system uses a slightly different format than Project 54. It is built around two computers in the trunk, with a screen mounted in the dash. One of the greatest benefits of TacNet is the reduction of clutter in the police unit interior. Being a fully integrated system, TacNet utilizes a unique pod-like command center in the area of the officer's center console, so the only equipment in the driver's compartment is the MDC screen, the pod controller and a "tucked away" keyboard in case the officer would like to type a report or other lengthy document. The proprietary pod controller acts as a rest for the officer's hand, where all functionality can be activated through the push of a finger. The thumb initiates the voice recognition component, telling the unit to listen for the officer's commands. Visteon has approximately 200 TacNet systems installed in various agencies throughout the U.S., and they also had their first California installation in 2005 at the Rocklin Police Department (both Rocklin's and Carlsbad's experiences are discussed later).

The voice recognition components in both Project 54 and TacNet are successful because they work. Problems with the computer recognizing commands are limited because both systems work based on a specific command set for each function performed. There is little difficulty recognizing multiple users without user profile development because commands are set to be distinguishable, unique and simple, so there is not a problem with the computer understanding what the driver wants done.<sup>6</sup> The on-board computer employs a microphone mounted near the visor that is activated through any variety of

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<sup>6</sup> Interview, Captain Dale Stockton, Carlsbad Police Department (2005)

switching mechanisms. With the push of one button, multiple commands can be given to quickly put into motion the simultaneous multiple tasks that must occur when an officers goes into action. Using only voice commands, these systems can activate the lights, siren and video camera and advise dispatch of the officer's location.<sup>7</sup> Voice recognition software can be programmed to operate virtually any electronic device in the patrol unit that can be designated a specific command set.

### ***Carlsbad and Rocklin -- Field Testing VRT***

In 2004, the first police unit in California was equipped with the Project 54 technology at the Carlsbad Police Department. The CPD decided to pursue a VRT solution to accompany installation of mobile data computers (MDC's) into all their police units. This decision was based on their research that revealed other agencies experienced a significant increase in officer at-fault traffic collisions when computers went into patrol cars. They began looking at options to mitigate the problem and found Project 54. The cost of installing the Project 54 equipment was about \$1,500 per unit.<sup>8</sup> Given the expense of MDC installation in all the patrol units, and the potential expense of increased property damage as well as officer injury and claims due to accidents, Project 54 seemed an inexpensive, preventive measure.

"The best part of having VRT available in patrol cars is that it offers another tool for officers to employ, and each officer is able to exercise his or her own style and comfort level in utilizing it," said Captain Dale Stockton, who headed up the Carlsbad research,

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<sup>7</sup> Tangonan, S. (2004), *Technology Puts Officers in Command*, The San Diego Union-Tribune Online, [www.signonsandiego.com](http://www.signonsandiego.com)

<sup>8</sup> Interview, Captain Dale Stockton, Carlsbad Police Department (2005)



product selection and subsequent installation of Project 54. "And it isn't an 'all or nothing' choice," Stockdale adds. "The beauty of Project 54 is that the whole system is redundant so officers can choose which components to use (or not)." All components of the vehicle can be run either by voice activation, MDC touch screen or the old standby manual switches. Officers are intrigued, and tend to explore the voice activation option when they find their own answer to the question, "What's in it for me?" Stockdale said. As they work with the system and find little ways here and there to increase efficiency and make their job easier, they are more apt to push the system to greater levels of performance. Stockton said Carlsbad's goal to "minimize hands off the wheel and eyes off the road" has been achieved, and continues to improve as officers become even more proficient with the technology through repetitive use and enhanced features they continue to add.

The Rocklin Police Department is equally pleased with their investment in the Visteon TacNet system. Sgt. Terry Roide says TacNet has been well received by their officers. "Like anything, it takes a bit of getting used to," said Roide, who noted officers are especially pleased with how this new system has cleaned up the interior clutter of their police cars. Because all functions can be operated via voice command or touch screen, the need for manual switches goes away. But Sgt. Roide tells a cautionary tale that shouldn't be taken lightly as we move into new territory with these technologies that are significantly changing the way we do business. In October, 2005, Rocklin Police Officer Matt Redding was struck and killed by a drunk driver while directing traffic on Highway 65. Although Officer Redding died at the scene and could not have benefited from any additional life-saving efforts there, help for him was not easily summoned. Officer

Redding was accompanied by a civilian ride-along that night. When the accident occurred, the rider immediately began making attempts to radio for assistance. Being in a TacNet car, however, he was unable to intuitively know how to use the unit radio. There was no traditional microphone to pick up and call with, and he did not know the first thing about how to activate the radio via voice command, pod device or touch screen. After about five minutes of floundering in panic at this tragic scene, the young man had the presence of mind to remove the handheld radio from the deceased officer's belt and call for help. As a result of this incident, Rocklin Police will be installing an external hand microphone as an intuitive back-up system that will be recognizable by civilians and police personnel from neighboring agencies that may not be familiar with this hi-tech equipment.

#### *And the beat goes on....*

In addition to operating the patrol vehicle, voice recognition report writing tools are also important to consider. Officers have become more and more tied to computers for endless data entry and report writing. This dependency is decreasing productivity and in-field time. Voice recognition applications may be a viable solution to report data entry and narrative dictation.

There are some agencies in California currently using voice recognition technology in report writing applications; however, none of these dictation solutions have as of yet made it to the patrol car as part of an integrated system. A survey of California Police Chiefs in April, 2005 provided good insight as to the successes and struggles with voice recognition reporting solutions. The agencies responding to the survey indicating they

had experience with voice recognition reporting were San Mateo, Ripon, Chula Vista, Los Angeles, Glendora, Barstow and King City Police Departments. These agencies have had successes and challenges utilizing voice recognition for report writing.

All of the agencies who responded said they use the “Dragon - Naturally Speaking” voice recognition product.<sup>9</sup> Some of the pros shared by the chiefs were the minimal training of the software for a particular user, compatibility with multiple software applications and 98-99% accuracy rates for officers who took the time to master the system.

Problems with voice recognition in report dictation seemed mostly related to user issues. Officers are forced to learn and become proficient at dictation methods to have the best results. It is also a new way of doing business, and change of this nature is very significant. It is sometimes very difficult to get officers to embrace the change to the degree necessary to get the most out of the product. The survey results consistently showed concern regarding the fact that each officer must take time to be trained how to operate the software to create a computer recognized “user profile.” In addition, these user profiles must be loaded onto each computer for which a particular user wants to work. There are also issues with the voice recognition software understanding individual officer accents or speech idiosyncrasies. Further, a quiet work environment is required to overcome problems with background noise. Although the recognition rate under ideal conditions is very high, editing is always necessary, as the system is not capable of recognizing homonyms or grammatical detail without specification by the user. There is

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<sup>9</sup> Dragon Naturally Speaking is a voice recognition software program made by Scansoft that can be installed on any PC to integrate with a wide variety of computer applications.  
<http://www.itreviews.co.uk/software/s200.htm>

still an occasional misidentification of words by the software, especially with personal pronouns and police jargon. As with any technology, the more familiar the user becomes with the system, the fewer the problems they will experience. Again, it is a matter of commitment to change and learning, and the process takes time in order to be successful.

There is potential, once officers have become proficient users of voice recognition systems and dictation techniques, they may be capable of dictating reports into digital recorders in the field that can later be downloaded at the station and converted to text documents.<sup>10</sup> Ultimately a built-in voice recognition component for report writing in the police car would be most beneficial. As officers grow in their familiarity with voice recognition systems of all kinds and technology improves relative to accuracy even under less than optimal conditions, the expansion of VRT applications to include report writing in the patrol car could be the next “big thing.”

### *Working out the bugs*

The immediate future of VRT should be about improving applications put into recent use. For example, scientists in the field are working on “noise correction software” to solve ambient noise problems.<sup>11</sup> Work is underway to improve microphones being used for VRT that should be especially helpful in the area of report dictation. Some interesting approaches include using more than one microphone to distinguish between noise and actual speech. By using two microphones in the environment, one will have a concentrated voice (the speaker) as well as ambient noise. The second will only hear

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<sup>10</sup> Interview, David Schorr, Dragon Naturally Speaking sales representative (2005)

<sup>11</sup> Weston, T. (2000), *Affordances of Voice Recognition*, Internet Article, [http://florin.stanford.edu/~t361/Fall2000/TWeston/consumer\\_products.html](http://florin.stanford.edu/~t361/Fall2000/TWeston/consumer_products.html)

ambient noise. By selecting the signal that doesn't come from both microphones (the speaker's voice) and eliminating all other signals (the ambient noise), the background noise problem may be resolved. Admittedly, the patrol car environment is a difficult one for VRT, especially relative to ambient noise. With radio traffic and other background noise causing interference, mastering all the potential applications in the future (including commanding vehicle functions and report dictation) will be a good challenge to the potential of VRT. The ongoing research and development we see underway will continue to improve voice recognition ease of use and overall accuracy. The better the functionality of voice recognition software, the more likely we will see broader applications in the patrol environment.

### *Seeing the future*

In May, 2005, a panel of experts convened to discuss trends in voice recognition technology and how they may impact the future of policing.<sup>12</sup> The panel felt that as we continue to make technological advances, society will progress toward more hands-free, smart technology in all areas of our personal and professional lives. The panel saw potential in the use of VRT for operating a patrol cruiser and in report writing solutions. In considering other technologies available that could be combined with VRT, the panel envisioned many different performance enhancement tools for officers in the future. Wireless Data Transfer (WDT) technology, such as Bluetooth,<sup>13</sup> provides a platform for wirelessly linking various network devices, such as phones, Personal Digital Assistants

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<sup>12</sup> Panel members included police professionals representing all levels, a hospital C.E.O., a Deputy District Attorney, a college professor, information systems personnel and a voice recognition industry representative.

<sup>13</sup> <http://www.bluetooth.com/Bluetooth/>

(PDAs), computers, etc. over short distances. Further development of various WDT technologies, combined with voice recognition, have the potential to greatly enhance the use of the other existing police technologies.

For example, imagine a police officer wearing a small headset on his or her ear that operates as both phone and radio connection with the dispatch center. While the officer is managing a crime scene or dealing with a dangerous suspect, his communications could be immediate and effective while he is both mobile and hands-free. As first imagined in the Dick Tracy comics in the 1930's, the officer might also wear a digital assistant on his wrist to wirelessly transmit and receive data from the patrol unit MDC via voice command. All the same computer information now available on the officer's arm, but with hands-free operation! While the panel was prolific in thought regarding the possibilities of voice recognition applications, there were also concerns about challenges surrounding this new technology.

One of the most prominent concerns was the cost of VRT. Voice recognition components, while not exorbitant in cost, may be difficult for some departments to pay for. Competition for budget resources will necessitate providing basic services first. Technology is often thought of as a luxury rather than a necessity, and even though the price of technology should continue to become more affordable, economic challenges will still exist. Other issues brought up by the panel included concerns about security, especially as discussion around the use of this technology for report dictation. If officers record statements for voice recognition transcription, could those recordings be subject to legal discovery? This could put an undue strain on Records Departments trying to

manage storage and discovery production of such items. Another concern the panel noted was projecting how VRT would be used in remote applications in the future. For example, personal digital assistants for ticket writing, etc. may remotely connect to an officer's vehicle, with voice recognition operation capability. The panel felt as technologies like VRT continue to be implemented; confidential police records & critical systems may become more vulnerable to hacking.

Many of the concerns noted by the panel were projections of possibilities for the future. These concerns support the need for a team to actively identify and attempt to mitigate problems as they surface in order to make the most of the technology and its capabilities. A more immediate factor that might impede progress for a department that decides to deploy voice recognition systems in their patrol cars may be the users themselves.

### ***Embracing Change***

VRT is a rapidly expanding industry, becoming increasingly integrated into a variety of technical equipment. It is the growing expectation of society that these tools will be commonplace and increasingly efficient, accurate and effective as time goes on. From a policing perspective, there is also an expectation this technology has the potential to enhance our performance and service delivery. After all, if it doesn't improve the way you're doing business, why go after it?

There is a natural temptation to resist such technology, as it is new and different. It is a significant change in how we conduct business. In an industry wrapped tightly in tradition and regulation, this may be the most difficult hurdle to jump. Part of the human

experience is an appreciation for and comfort in structure and predictability.<sup>14</sup> The police profession is chaotic and unpredictable...you never know what the next call will entail. A strong need, therefore, exists to control and make predictable those aspects of the job that are within our purview. This mindset doesn't provide the best platform for creative thinking and implementation of new ideas or procedures. It is highly likely that without a well thought out plan for implementation, any new technology that significantly changes the way an officer conducts his or her daily business will be met with a good deal of resistance. Make no mistake...successful implementation lies in the hands of the users. Thought must be given in each individual agency as to how to best sell the idea of change to the troops who are responsible for the successful implementation of any new idea, philosophy or tool. It will be important to gather support and develop a synergy and excitement for voice recognition technology within the organization.

Consider utilizing a collaborative group process for evaluating and selecting the voice recognition application that will work best in your department. Take the time to identify key stakeholders in making the project a success and involvement in making it happen. This can be done by establishing an Executive Advisory Committee (EAC) to conduct research and provide recommendations regarding product selection, level / pace of implementation, training requirements and associated policies and procedures. At least one representative from each of the stakeholder groups<sup>15</sup> should be asked to participate

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<sup>14</sup> Palmer, B. (2004) Making Change Work: Practical Tools for Overcoming Human Resistance to Change, American Society for Quality, Quality Press, Milwaukee

<sup>15</sup> Stakeholder: a person or group that has an investment, share, or interest in something, as a business or industry. Factmonster Dictionary online: <http://www.factmonster.com/ipd/A0668824.html>



on this committee. Much can be gained from involvement by all concerned parties. The individual concerns and desires of the group can be addressed during the planning phase, which should reduce the level of anxiety or questions that may arise later in the implementation phase. Additionally, each of these stakeholders has a greater likelihood of buying into the concept of voice recognition in the patrol environment if they are involved in making it happen. As a result, there will be voice recognition advocates built into each stakeholder group who can act as “experts” and advisors on the subject to those within their respective groups who may have questions or concerns.

Once implementation decisions are made and executed, the EAC should continue to meet and evaluate the progress and performance of the voice recognition system. Did it accomplish what was intended – greater efficiency, increased safety, better investigative resources, etc? What unanticipated results came about, both positive and negative? What can be done to maximize and further develop the system in the future? What can be done to minimize any negative affect? What future developments should be considered for implementation? These are all questions that should be asked periodically once the system is in use to ensure optimum performance. Challenges are bound to happen, so be prepared! Utilize your group as problem solvers should the need arise. If you are careful about product selection and implementation, you won’t face any insurmountable issues; if people have been a part of the selection and implementation, they will be invested in the solutions. Technology is a great thing, but people are still your best resource, so be sure to keep them involved in trouble-shooting things until you

get it right. Make the technology work for the organization, so the organization doesn't become slave to the requirements and constraints of any high-tech system.

### **Conclusion**

The research is clear and convincing that voice recognition technology has a place in policing and has definite potential to improve safety and efficiency for the first responder. Leaders will need to carefully evaluate their organizations to determine the right time to embrace this new way of doing business and how to achieve the necessary levels of individual technical abilities to succeed in doing so. Timing to move forward in this journey is critical; however, success is achievable through careful execution. Three important elements stand out as critical to successful realization of this desired future:

- Create a collaborative group, representing all levels and divisions of the organization, for research, product selection and fine-tuning of strategic planning and the acquisition and implementation phases
- Exercise caution relative to the pace and level of introducing voice recognition technology to create the greatest level of support organization-wide and to ensure user capability levels keep up with the rate of change
- Carefully evaluate the progress and outcomes with an organizational mindset on flexibility and willingness to modify or depart from pre-existing plans to achieve overall success of the project

The most difficult issue to overcome when introducing this technology is with the envisioned end-users. Voice recognition applications have grown by leaps and bounds over the last three decades, and progress will continue unfettered. All cautionary notes clearly relate to people and how they will adapt, not how technology will be adapted to the people who use it. Keep stakeholders involved, move at a pace they can keep\*up with and make a practice of continual evaluation and adaptation to maintain steady, forward movement. This plan will not only support the successful implementation of a voice operated patrol vehicle; it will poise your organization to embrace the next technological opportunity available. So the next time a voice recognition nay-sayer tries to upset your progress, ask him, "Can we talk?" They might be surprised by the answer.